

## SECTION 434121

### FIELD FABRICATED TANKS AND ACCESSORIES

#### PART 1 – GENERAL

##### 101. EXTENT

- This Section covers the technical and associated requirements of atmospheric field fabricated tanks and accessories for use in electric power generating stations. The CONTRACTOR'S shall conform to the requirements of this Section and to the requirements indicated on the design drawings.
- 101.1 CONTRACTOR shall provide, but not necessarily be limited to, design, fabrication, delivery, installation support and service for the field-fabricated tanks and accessories specified.
- 101.2 The tanks and accessories shall conform to the requirements of the governing Code(s); in other respects, tanks shall conform to the requirements of this Section and shall satisfy all conditions and requirements of the specification.
- 101.3 In the event of variance between the general requirements delineated in this Section and the particular requirements set forth in the specification, the specification shall take precedence.
- 101.4 CONTRACTOR shall be solely responsible for advising the Engineer in writing of any conflicts between the specification and CONTRACTOR's design, including performance and levels of quality. CONTRACTOR agrees that its obligations, liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of the specification.

##### 102. REFERENCES:

- 102.1 Publications of the following agencies shall form a part of the specification to the extent specified therein. All references to their publications are to the latest issue of each, together with the latest additions and/or amendments thereto, as of the date of Contract, unless otherwise indicated. References to the sponsoring agencies will be made in accordance with the abbreviations indicated:
- a. AISC American Institute of Steel Construction
  - b. ANSI American National Standards Institute
  - c. API American Petroleum Institute
  - d. ASTM ASTM International
  - e. AWS American Welding Society
  - f. AWWA American Water Works Association – D100 Welded Steel Elevated Tanks, Standpipes and Reservoirs for Water Storage
  - g. IEEE Institute of Electrical and Electronic Engineers
  - h. ISO International Organization for Standardization
  - i. OSHA Occupational Safety and Health Administration
  - j. SSPC Society for Protective Coatings

- k. UL Underwriters Laboratories
  - l. The applicable building code
  - m. Other codes and standards as applicable and as further listed in this Section
- 102.2 Other codes and standards, including those of other countries, can only be used with the formal acceptance of the DISTRICT and Engineer.

## **PART 2 – PRODUCTS**

### **201. DESIGN AND CONSTRUCTION**

#### **201.1 General Requirements**

- a. Construction of tanks shall conform to all federal, state and local codes having jurisdiction and to the specific codes referenced below.
- b. The tanks shall be designed, constructed, fabricated and tested in accordance with the requirements of the industry standards in effect at time of award, including any additional requirements that may be specified.
- c. Design of all tanks shall satisfy all requirements specified.
- d. Tank selection and design will be by CONTRACTOR based on the specified conditions.
- e. Tanks shall be furnished complete with all required nozzles, vents, drains, flanges, manholes and access openings with covers, gaskets and bolting; ladders; platforms; handrails; internal piping with suitable supports, if required; and such braces, brackets, legs, etc., as required, including all other appurtenances called for in the specification and data sheets.
- f. Tanks shall be designed in accordance with API 650 and AWWA-D100.
- g. Tanks shall be self-supporting between supports. If needed, stiffeners shall be located outside of the tank. Welded attachment plates for pipe supports should be equipped with bolted type connections for pipe support attachment.
- h. CONTRACTOR shall perform all calculations necessary to ensure the integrity of each tank and shall carefully check the design and provide proper plate thickness, reinforcement and supports as required for the service for which each tank is intended. Calculations shall be in sufficient detail to permit independent checking.
- i. Tanks shall be of all-welded construction and the wetted surfaces shall be designed to withstand the maximum liquid depth plus 10 feet higher than the maximum liquid level using the specific gravity of liquid in the tank.
- j. CONTRACTOR shall design tanks for all loads applicable: seismic loads, dead loads and live loads (including hydrostatic pressure). Loading parameters are specified in Section 011900, Site Data.
- k. The overturning moment applied to the shell from the response of the tank liquid mass shall be included in the design calculation.
- l. The bottom of tank shall be sloped towards the outlet drain connection for gravity draining of the tanks.



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- m. Inflow and outflow capacities shall be as required for the application. Air venting capacity shall equal or exceed the inflow or outflow capacity, whichever is larger. Overflow capacity shall exceed the inflow capacity.
- n. For the absorber tanks, maximum tank deflection shall not exceed 1 degree. To meet this requirement CONTRACTOR shall provide walls of adequate thickness or extra external tank stiffeners. CONTRACTOR shall provide detailed calculations verifying the deflection.
- o. Tank roof load shall be designed for 75 psf for the entire surface.
- p. CONTRACTOR responsible for design, supply, and installation of all pipe supports inside and outside of the tanks and shall take into consideration all piping loads.

#### 201.2 Joint construction

- a. All joints shall be double-welded full-penetration butt joints.
- b. Lap joints may be used on all field erected tanks except the absorbers. The lap joints must be bottom joints for tanks with flat bottoms fully supported on foundations or grade.
- c. Nozzle-to-vessel welds shall be full-penetration welds.
- d. Longitudinal joints shall not be located where an obstruction may interfere with proper inspection of the weld. Longitudinal joints shall not be aligned and shall be offset a minimum of 5t where 't' is the shell plate thickness.
- e. For the absorber tanks, lap joints are unacceptable. Absorber tank bottoms shall be welded in accordance with article 301.21 in this Section.

#### 201.3 Nozzles

- a. Nozzles shall not be located in longitudinal or circumferential welds. Spacing between attachment welds shall conform to API 650 and AWWA-D100. All nozzles shall be attached by welding completely through the total thickness of the tank wall including any reinforcing pad, which may be used. Inlet nozzles shall extend inside the tank ½-inch to provide a drip lip. This requirement is waived where it interfaces with the application of tank lining. Outlet or drain nozzles located in the bottom of the tanks shall be designed with no internal lip so that complete drainage is obtained.
- b. Nozzles and pipe for these carbon steel tanks shall be as follows, except where design conditions require heavier wall thickness:
  - b1. Sizes 2-inch NPS and smaller: Schedule 80
    - b1.1 In the absorbers, small bore pipe nozzle connections shall be of C-276 steel as connections are too small to line or accommodate an FRP insert.
  - b2. Sizes 2-1/2-inch to 10 inch NPS inclusive: Schedule 40
  - b3. Sizes 12-inch and larger: 3/8-inch wall.
- c. The number and size of the connections will be designated by the CONTRACTOR. CONTRACTOR shall furnish other nozzles or adjust sizes as may be required by the DISTRICT. In addition, CONTRACTOR shall design and furnish adequate overflows, screened vents, instrument nozzles, etc., in accordance with industry standards.



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- d. Select nozzles may be designated by DISTRICT during drawing review to NOT extend radially from the tank wall, but rather at a skewed angle.
  - e. Tank nozzles shall be flanged nozzle terminals, and shall conform in dimensions and drilling to ANSI B16.5, class 150. Flanges shall be of the welding neck or slip-on type, flat face. CONTRACTOR is made aware that Engineer may change the nozzle flanges from flat face to raised face during drawing review. 24 inch manways and covers shall be rated for the design pressure of the tank.
  - f. Tank nozzles, nozzle flanges, and manholes shall be of the same base material as the tank shell, except for nozzles in lined tanks, where the nozzle material shall be the same as the connecting piping.
  - g. Flanged nozzles shall extend outside the tank exterior wall by 6" for all nozzles 2" and smaller, 8" for pipe sizes from 2-1/2" up to 8", 10" for pipe sizes from 10" to 18", and 12" for sizes 20" and larger.
  - h. Nozzles shall be protected with suitable covers or blind flanges to maintain the cleanliness of the tank interior. Covers may be plastic, metal, or 1/2" plywood designed for the purpose. All mating edges to be secured with duct taping.
  - i. Absorber tank nozzles shall be flanged, including the vent connection. The gooseneck on the vent should be made from flanged pipe sections.
  - j. Tanks shall be located in accordance with the plant coordinate system. All nozzles shall be located to elevations referenced on site datum.
- 201.4 Temporary lugs shall be provided for fit up. Where possible, temporary lugs shall be installed on the outside of the tank.
- 201.5 Manholes / Access Doors
- a. Manhole manways gaskets shall be so arranged as to avoid damage to the gasket material when manhole covers are removed and replaced.
  - b. Gaskets for joints between manholes or handholes and covers shall be as follows, unless otherwise specified:
    - b1. Non-Asbestos Inorganic Fiber Composites
  - c. There shall be two manholes in the tank shell. The shell manholes shall be diametrically opposite. Shell manholes shall be 24 inches.
  - d. Manholes shall be provided with hinges, grab bars, and a swingable lifting support (davit) to facilitate removal without the use of a crane.
  - e. All access doors shall be furnished with gaskets and guaranteed to assure a tight fit. Gaskets for joints between manholes, handholes and covers shall be rubber for all rubber-lined tanks and per API 650 and AWWA D100.
- 201.6 Reinforcements:
- a. Openings in tank shells, which are located below the overflow level and are larger than required to accommodate a 2" standard weight coupling, shall be reinforced to replace the cross-sectional area of the hole. Reinforcements may be in the nozzle, shell, or both as required in API 650 and AWWA-D101.

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- b. The minimum cross-sectional area of the reinforcement shall be not less than the product of the diameter of the hole, in inches, cut in the shell and the shell-plate thickness as required in API 650 and AWWA-D101.
- c. The portion of the nozzle neck that may be considered as reinforcement is that area lying within 4 times the nozzle wall thickness of both the inside and outside shell surface, plus the area lying within the shell-plate thickness.

## 202. MATERIALS

202.1 Materials shall be as listed below, unless the applicable governing standard is more stringent. In those cases, materials shall be in accordance with the applicable governing standard. Compatibility of the materials with the fluid handled is the responsibility of the CONTRACTOR.

- a. Tanks shall be constructed of ASTM A285 Grade C, carbon steel plate. (ASTM A36 may also be bid on approval.) Carbon steel may be cut to size or shape by machining, shearing, or thermal cutting. Thermal cutting shall be followed by the removal of approximately 1/32-inch of cut surface by machining or grinding. The finished edge shall be free of irregularities greater in depth than 1/16 inch in any 1/4-inch length.
- b. All internal pipe and pipe nozzle material shall be carbon steel ASTM A-106 GR A or B, or ASTM A-53 GR B. Pipe fittings shall be carbon steel ASTM A-105. Forgings shall be carbon steel ASTM A-105. Castings shall be carbon steel ASTM A216 GR WCB or ASTM A-27 GR 60-30.
- c. U bolts or other fasteners shall be carbon steel with a minimum diameter of 3/8". Assembly bolts and hex nuts are 316SS. Submerged fasteners are Hastalloy.
- d. Structural supports shall be carbon steel ASTM A36.
- e. Welding electrodes shall be AWS A5.1.

## 202.2 Plate thickness

- a. The minimum plate thickness shall be 1/4" exclusive of any corrosion allowance, but not less than API 650 and AWWA-D100 requirements, as applicable.
- b. Corrosion allowance: The calculated thickness of all carbon steel materials in contact with water shall include a minimum 1/16" corrosion allowance. The corrosion allowance for beams and channels shall be added to the webs only, not to the flanges.
- c. The corrosion allowances specified herein are minimum values. CONTRACTOR shall add any additional allowances required for the service by the applicable code.
- d. The minimum nominal thickness of the bottom plate of fully supported flat-bottomed vertical tanks shall be increased for corrosion protection.

## 202.3 Pipe

- a. Carbon Steel: ASTM A106 Grade A or B; ASTM A53 Grade B

## 202.4 Castings

- a. Carbon Steel: ASTM A216 Grade WCB; ASTM A27 Grade 60-30



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- 202.5 Fittings
  - a. Carbon Steel: ASTM A105
- 202.6 Forgings
  - a. Carbon Steel: ASTM A105
- 202.7 Structural Supports
  - a. Carbon Steel: ASTM A36
- 202.8 The thickness of structural shapes shall not be less than  $\frac{1}{4}$  inch.
- 203. ADDITIONAL REQUIREMENTS
- 203.1 Instrument Nozzles
  - a. Side-entering-level instrument nozzles shall not be less than 3 inches or more than 6 inches above the bottom of the tank.
  - b. Instrument nozzles penetrating the lower head of cone or dished-bottom tanks shall be installed in a horizontal position, sloped to drain into the tank and cut off square not less than 2 inches inside the tank.
- 203.2 External Ladders and Platforms
 

All ladders, platforms and handrails, if required, shall be provided as specified.
- 203.3 Personnel Loading
 

Roofs and bottoms shall be designed to support maintenance personnel working on the tank.
- 204. ACCESSORIES AND APPURTENANCES
- 204.1 Internal Piping (if applicable):
  - a. Internal piping refers to standpipes, stilling tubes, heating coils, cooling coils, air sparger piping and hydraulic mixer piping and bubbler pipe for level instruments.
  - b. Internal piping shall be located and supported to provide for necessary expansion and contraction. Supports shall be designed to withstand reaction forces from mixers and forces from maintenance activity by workers in the tank.
  - c. Internal piping shall be bolted to supports to permit easy replacement.
  - d. Internal piping support brackets in unlined tanks shall be of the same material as the tank shell. Carbon steel support brackets shall be a minimum of 3/8-inch thick.
  - e. All internal piping below the overflow shall be joined by welding, except internal piping in lined tanks may be flanged to allow installation through the manhole, if the lining application cannot be made with the internal piping in place.
  - f. With each atmospheric vertical tank, a submerged inlet (downcomer) pipes with a vacuum breaker shall be located inside the tank at the top to prevent inadvertent siphoning of the tank contents.



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204.2 Hydraulic Mixers (if required)

- a. Tank contents will be recirculated through the mixer by a pump at the flow rate and head determined by CONTRACTOR.
- b. Mixer shall be sized and properly located by CONTRACTOR to attain uniform mixing in a minimum time with indicated flow.
- c. CONTRACTOR shall be responsible for furnishing a suitable mixer for each application. Mixers shall be water jet eductors, Model 258 or 268, as made by Schutte & Koerting, or equivalent designs and/or models reviewed and accepted by the Engineer.

204.3 Electric heaters (if required)

- a. CONTRACTOR will be responsible for furnishing and incorporating in the design and fabrication of the tank, electric heaters as herein specified. CONTRACTOR shall supply 480-volt ac, 3-phase, 60 Hz, immersion heaters with a corrosion-resistant metallic flange and as called for in the specification. The heater elements shall have Inconel sheaths and shall be equipped with corrosion-resistant metallic NEMA-4 terminal boxes. Heaters shall be controlled by the DISTRICT's DCS.
- b. CONTRACTOR shall furnish a Type E thermocouple with temperature transmitter and thermowell for use in controlling the heaters through the DISTRICT's DCS. Location of the temperature measurement equipment shall be determined by CONTRACTOR so that optimum tank heater control characteristics are obtained.
- c. Heaters shall be located near the bottom of the tanks and installed by CONTRACTOR through the sides of the tanks with necessary provisions so that elements are accessible and removable without draining the tanks and so that the maximum allowable sheath temperatures are not exceeded. Contact rating shall be as specified.

204.4 Air Spargers (if required)

- a. Spargers shall be designed for uniform mixing of the tank contents using the minimum airflow per square foot of projected area above the sparger.
- b. Spargers shall be located sufficiently close to the bottom of the tank, by contouring, if necessary, to keep solids stirred up.
- c. Air holes shall be a minimum 1/8-inch diameter to prevent plugging by dirt in the supply air and piping. Air holes shall face downward at least 45° from the horizontal plane.
- d. Spargers shall encompass (as much as possible) the maximum horizontal tank area.
- e. Header shall be enclosed with 60-mesh stainless steel screen to prevent particulates from entering 1/8-inch air holes.

204.5 Bubbler Pipes (if required)

- a. Pipes shall enter through the top of the tank. Penetrations shall be through a 2-inch blind flange on closed-top tanks. The top of the pipe shall terminate 6 inches above the blind flange in a 1/2-NPT thread.
- b. Pipes shall be vertical throughout their length and not contoured to follow the tank wall.

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- c. Pipes shall be made of ½-inch, Schedule 80, 304 stainless steel and shall have an external cross or angle shape, full-length stiffener attached.
  - d. Pipes shall extend to approximately 2 inches from the bottom of the tank and be notched.
  - e. Pipes shall be loosely supported near the bottom of the tank in a guide bracket to prevent excessive movement during tank agitation but shall be free to be withdrawn from above.
- 204.6 Spray system (if required) shall be provided in top of tank and shall be designed to successfully wash the walls of solids with the specified water rate.
- 204.7 Grounding System:
- a. Two electrical pads shall be mounted on each tank located outdoors, as specified, for connection to DISTRICT's ground grid. Grounding pads shall be located 180° apart on vertical tanks and shall be threaded to accept a standard two hole NEMA configuration lug.
- 204.8 Tank Diaphragms (if required)
- a. Tanks shall be equipped with nonpermeable, nonflammable membranes. The membranes shall be suitable for the temperature and pressure specified.
  - b. Diaphragms shall be affixed to the roofs of the tanks with care to prevent localized overstressing and distorting of the diaphragms. The diaphragms shall be leak-tested with air pressure on the tank at the design pressure of the tank.
- 204.9 Tank Vents
- A vent with weather hood and bird screen (for outdoor tanks) shall be supplied with each atmospheric vertical tank. Tank vents shall be "goose neck" type and shall be constructed of corrosion resistant material.
- 204.10 Vortex Breakers
- All pump suction nozzles on water tanks shall have anti-vortex provisions.
- 204.11 Instrumentation and Controls
- a. Instrumentation shall meet the requirements of Section 409119.
  - b. CONTRACTOR shall provide a suitable number of instrument connections to support the project requirements.
  - c. As a minimum, all pressure and temperature instrument connections shall be 1-inch size, while level instrument connections shall be 2-inch minimum.





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205. CLEANING

205.1 After fabrication and immediately prior to the painting or coating process, tanks shall be shop cleaned as specified. The following additional requirements shall apply:

205.2 Solvent Cleaning

- a. Solvent cleaning shall be used primarily to remove oil and grease and shall conform to the applicable requirements of SSPC SP-1, Solvent Cleaning.
- b. Solvent cleaning shall also include removal of soil, cement spatter, drawing compounds, salts and other foreign matter as set forth in SSPC SP-1.
- c. No flammable or toxic cleaner shall be used.

205.3 Hand Cleaning

- a. Hand cleaning shall be used primarily to remove loose mill scale, loose rust and loose paint and also all slag, weld spatter and alkaline scale from welded surfaces, by the use of hand brushing, hand sanding, hand scraping, hand chipping or other hand impact tools and shall conform to the applicable requirements of SSPC SP-2, Hand Cleaning.
- b. Oil, grease and salts shall first be removed by Solvent Cleaning.

205.4 Power Tool Cleaning

- a. Power tool cleaning shall be used primarily to remove loose mill scale, loose rust and loose paint and also all slag, weld spatter and alkaline scale from welded surfaces by the use of power wire brushes, power impact tools, power grinders, power sanders or a combination of these methods and shall conform to the applicable requirements of SSPC SP-3, Power Tool Cleaning.
- b. Power tool cleaning shall be used as required to supplement Hand Cleaning and/or shall be used where specified or directed.
- c. Oil, grease and salts shall first be removed by Solvent Cleaning.

205.5 Commercial Blast Cleaning

- a. Commercial blast cleaning shall be used to remove mill scale, rust, rust scale, paint and foreign matter by the use of abrasives propelled through nozzles or by centrifugal wheels and shall conform to the applicable requirements of SSPC SP-6, Commercial Blast Cleaning.
- b. Heavy deposits of oil and grease shall first be removed by Solvent Cleaning.
- c. Excessive rust scale shall be removed by Hand Cleaning or Power Tool Cleaning prior to blast cleaning.

205.6 Blast Cleaning to "White" Metal

- a. Blast cleaning to "white" metal shall be used for the same purpose as Commercial Blast Cleaning and shall conform to the applicable requirements of SSPC SP-5, Blast Cleaning to "White" Metal. "White" metal is defined to mean a surface with a gray white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings.
- b. The depth of anchor pattern shall be as required by the coating manufacturer or as specified.

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- c. Heavy deposits of oil and grease shall first be removed by Solvent Cleaning.
- d. Excessive rust scale shall be removed by Hand and/or Power Tool Cleaning prior to blast cleaning.
- e. Only shot shall be used on interior surfaces.
- f. Interior weld seams shall be ground smooth and level. All corners must be smoothly rounded and ground to a ¼-inch minimum radius prior to beginning the blast cleaning operation.
- g. On all work where welding has been done, all surfaces shall have the slag and weld spatter removed and shall be cleaned by Power Tool Cleaning.

206. INTERIOR COATING

206.1 All welding, machining, cutting operations, hydrostatic testing, non-destructive testing and cleaning procedures must be completed prior to the application of interior coatings to tanks.

206.2 Interior Rubber Lining

- a. Rubber linings or spray-on-type coatings, which are necessary for corrosive applications, shall be compatible with the pH, temperature and chemical concentrations of the stored solution. Details of the surface preparation, lining or coating and its application shall be submitted to the Engineer for review prior to work. Lining shall be not less than 3/16-inch thick throughout. Lining shall be compatible with the stored solution and conditions as specified. Linings provided for tanks shall comply with the requirements of the applicable industry standards.
- b. Linings shall conform to the surface of the tank with no folds, bulges or corner gaps. Application of the lining shall be continuous and shall extend to and cover the inside of pipe nozzles, flange faces, manhole covers and tank covers. No welding shall be done after linings are in place. Hinge material for hinged tank covers shall be as approved.
- c. Lining shall be applied by a licensed lining applicator in strict accordance with lining manufacturer's recommendations.
- d. It is essential that the shot blasting, if done by the tank manufacturer, be supervised by the licensed lining applicator since the internal prime coat must be applied immediately after blasting is completed to the licensed lining applicator's satisfaction. It is preferred, however, that the lining applicator does shot blasting.
- e. Any defects or deficiencies revealed by the tests shall be remedied by CONTRACTOR.
- f. All costs incurred due to the lack of integrity of the lining will be charged to the CONTRACTOR.
- g. CONTRACTOR shall state his guarantee of both his workmanship and the suitability of the lining for dilute acid and alkaline solution.

206.3 Absorber tanks

- a. Absorber tanks and slurry maintenance tank shall be flake glass lined.

206.4 Interior Spray-On Coatings (when specified)

Spray-on-type coatings shall be compatible with the pH, temperature and chemical concentration of the stored solution. The coating thickness shall be as specified.

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207. PAINTING

207.1 After cleaning, all tanks shall be painted in accordance with Section 099113.

208. INSTRUCTIONS FOR STORAGE AND HANDLING

In order to provide the DISTRICT with equipment in a corrosion-free state, CONTRACTOR shall furnish the DISTRICT with instructions for storage, handling and maintenance for this equipment prior to the installation, as well as for the period between completion of the installation and the time that the equipment is placed in service.

**PART 3 – EXECUTION**

301. FABRICATION

301.1 Material Cutting

- a. Carbon steel may be cut to size or shape by machining, shearing or thermal cutting.
- b. Thermal cutting shall be followed by the removal of approximately 1/32 inch from the cut surfaces by machining or grinding. The finished edge shall be free of irregularities greater in depth than 1/16 inch in any 1/4-inch length.

301.2 Welding

- a. Welding shall be performed in accordance with written qualified welding procedure specifications, which are in accordance with the ASME Boiler and Pressure Vessel Code, Section IX.
- b. All welders shall be qualified in accordance with the ASME Boiler and Pressure Vessel Code, Section IX.
- c. Welding shall not be performed when the surfaces to be welded are wet with rain, snow, or ice; when rain or snow is falling on such surfaces; or during periods of high winds unless the welder and the Work are properly shielded.
- d. No welding shall be performed when the ambient temperature in the immediate vicinity of the weld is below 0 °F. When the ambient environmental temperature is below 0 °F, a heated structure or shelter around the area being welded may be used to maintain the ambient temperature in the immediate vicinity of the welding at 0 °F or higher. When the base metal temperature is below 30 °F, the base metal within three inches of where weld metal will be deposited shall be heated to a minimum temperature of 70 °F, which shall be maintained during welding. Welding shall be planned and conducted to minimize warping or distortion. All welds shall be cleaned of slag and flux between passes and following the final deposit.
- e. Welding shall be planned and conducted to minimize warping and distortion. All welds shall be cleaned of slag and flux between passes and following the final deposit.
- f. All double-welded joints shall be back-chipped (grounded) or arc-gouged to sound metal prior to depositing the second side. Arc gouging is allowed only for ferritic materials.
- g. Grind all exposed edges with one pass of grinder and remove all burrs and weld spatter.

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- h. All welds shall be left in a final condition suitable for field painting of tank exteriors and rubber or vinyl ester coating of tank interiors by others. CONTRACTOR shall be responsible for correcting welds, mechanical joints, attachments or seams and interfaces that are deemed unacceptable for painting and coating.
- i. Welded joints shall not be peened.
- j. Wide welds to overcome poor fit are not permissible. Poor fits shall be remedied by suitable means and approved by DISTRICT.
- k. All shell joints shall be double-welded, full-penetration butt joints.
- l. Absorber bottom joints shall be double-welded, full-penetration butt joints. After welding absorber surfaces must be clean dry and free of dust, dirt, oil or other foreign matter. A NACE SP 0178 designation C surface and weld profile shall be achieved for all internal tank surfaces. No stitch welds are allowed on tank interior. Lap joints are unacceptable for absorber vessel bottoms.
- m. Conical roof-plate joints may be single-welded, full-fillet lap joints. The overlap shall be 5 times the plate thickness but need not exceed 1 inch. If specified in the specification, the roof plates inside the tank shall be seal welded to each other and to the top angle.
- n. All other roof-plate joints shall be double-welded, full-penetration butt joints.
- o. All nozzle-to-vessel welds shall be full-penetration welds.
- p. CONTRACTOR shall submit a detailed welding procedure for all tanks.

## 302. INSPECTION AND TESTING

### 302.1 Weld Testing

- a. Test Description
  - a1. All welds shall be visually examined. NDE personnel conducting the inspection shall be qualified and certified in accordance with ASNT SNT-TC-1A, or the exam shall be performed by an AWS-certified welding inspector (CWI) in accordance with the provisions of AWS QC1.
  - a2. Shell butt welds, annular plate butt welds, and flush-type connections shall be spot radiographed in accordance with the requirements established in the governing code (AWWA-D100 or API-650).
  - a3. Nozzle welds shall be examined, both inside and outside of the tanks, by the magnetic particle method per ASME Code, Section VIII, Appendix 6.
- b. Procedure Requirements
  - b1. Test procedures shall be available for DISTRICT's review. Each procedure shall, as a minimum, describe the objective and methodology of the test.
- c. Test Reports
  - c1. Reports covering all tests shall be available for DISTRICT's review. Each report shall, as a minimum, include a summary of conducting the test, the recorded test data, radiography films, any calculations, and results with a determination of "Pass" or "Fail".
- d. Remedies

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GERALD GENTLEMAN STATION UNITS 1&2

**FLUE GAS DESULFURIZATION SYSTEMS**



Specification G-5301  
Issue: Client Comments, Rev. 3  
September 8, 2011  
Project No. 12681-006

- d1. Any deficiencies in CONTRACTOR's equipment or material brought out during these tests shall be promptly repaired by CONTRACTOR using approved procedures at no expense to DISTRICT.

302.2 Interior Coating Testing

- a. The interior coating of tanks shall be tested for integrity after installation and curing for holidays, pinholes, bonding, etc. by an appropriate test. Tanks supplied with linings shall be given holiday tests (electric continuity tests).
- b. The interior coating of tanks shall be tested to determine the thickness of the coating applied.
- c. The minimum acceptable lining thickness shall be the specified nominal thickness.
- d. Results of all tests shall be documented in a test report with a sketch showing areas examined.
- e. DISTRICT reserves the right to witness all tests.

303. IN-SERVICE TESTING

After the equipment is put in service, DISTRICT will run tests on the equipment to ascertain that it is performing properly in every respect. CONTRACTOR shall arrange to have his authorized representative present to witness and assist in the tests, if requested.

END OF SECTION 434121

434121-13